

at Elizabethtown, N. C., on the 11th. The crest stage at Fayetteville was 42 feet, or 7 feet above flood stage, at 1 p. m. December 10, and at Elizabethtown 30.2 feet, or 8.2 feet above flood stage, on December 12.

The losses reported from these North Carolina floods amounted to only about \$3,000, while the money value of the property saved by the warnings was estimated at \$27,500.

The same general rain conditions that caused the North Carolina floods also extended to the southward and westward, and at Cheraw, S. C., on the Peedee River, the flood stage of 27 feet was exceeded by 1.9 feet on December 10. Although the flood stage had not been forecast, warnings had been issued to the lumber interests, and property to the amount of \$3,000 was saved. Advisory warnings were also issued on the 14th and 28th. In both instances the crest stages were slightly below flood stage.

The lower Santee River was in flood at the end of November, 1920, and flood stage continued throughout the month, with a crest stage of 14.1 feet at Rimini, S. C., on the 19th-20th, and of 13.5 feet at Ferguson, S. C., on the 20th, flood stage being at 12 feet at both places. Further advices regarding the flood were issued on the 15th and 27th, the latter extended so as to include the entire watershed of the Santee River.

As there is little or no grazing in the swamp region at this time of the year, and as the Santee River had been high or in flood since the middle of November, 1920, there was no damage from the floods.

East Gulf drainage.—There were very heavy rains over the watershed of the Alabama River on the 13th and 14th, and general flood warnings were issued on the 13th. While the flood stages were generally exceeded, the crests in the Tallapoosa and Alabama Rivers were lower by several feet than had been anticipated. Operation of the gates at Lock 12, Coosa River, and somewhat uneven rainfall distribution may have contributed to cause the discrepancies. Resulting losses and damage from the floods amounted to about \$15,000, and about the same amount was saved by the warnings. Warnings were issued at the same time for the Black Warrior and Tombigbee Rivers. The warning of December 14 for 46 or 47 feet in the Black Warrior River at Tuscaloosa, Ala., on December 15 or 16 was a failure, the crest stage having been but 25.2 feet (flood stage 46 feet) on December 15. As in the case of the Alabama River, uneven distribution of the precipitation was probably the cause of the failure of the forecast, as a sufficient amount to justify the forecast occurred at the reporting stations. The warnings of the 22d and 23d were not much below the forecast stage for the Black Warrior River, while for the Tombigbee River they were very accurate. Losses were very small indeed.

Floods were also general over the Pascagoula watershed of Mississippi on approximately the same dates as to the eastward, and the usual warnings were issued at the proper times for stages above the flood stage. The warnings were fully verified, as will be seen by the table and were the means of saving property valued at \$45,000. The losses and damage reached an approximate total of \$200,000.

The heavy rains of December 13 brought the waters of the French Broad River and tributaries to stages slightly above the flood stage. No warnings were issued and no damage was done. A similar occurrence was reported at Mendota, Va., on the north Fork of the Holston River.

The stage of 11.3 feet at Knoxville, Tenn., on the 15th was accurately forecast, but another forecast issued on

the 15th for a stage slightly above 13 feet on the following day (flood stage 12 feet) failed by about 2 feet, the crest having been only 11 feet. No damage was reported.

The flood in the Ouachita River of Arkansas was accurately forecast, and a crest of 33 feet, 3 feet above the flood stage, was reached at Camden, Ark., on December 28. The flood continued into January, 1921. The damage done was nominal.

Flood stages were just about reached at places along the Sulphur Fork of Red River on three dates during the month. No warnings were issued. The Trinity River at Dallas, Tex., was also above the flood stage on December 23 and 24, but without resulting damage. No other flood stages were reported along the river, although the stage at Trinidad, Tex., on December 27 was 25.8 feet, 2.2 feet below the flood stage.

The only other flood was in the Willamette River of Oregon. It was in progress at the close of the month, at which time the stage at Portland was 14 feet, 1 foot below the flood stage. A report on this flood will be made in the MONTHLY WEATHER REVIEW for January, 1921.

NOTE.—A report on the flood in the Eel River of California on November 17, 18, and 19, 1920, was received too late for publication in the November REVIEW. This flood was caused by heavy, warm rains, and melting snows, and caused damage to the amount of about \$60,000, of which perhaps \$50,000 was incurred by railroad interests. Warnings were issued as soon as possible, although somewhat late at first on account of unsatisfactory communications.

Estimated losses by floods.

River and district.	Farms, buildings, machinery, livestock, etc.	Suspension of business.	Value of warning.	Tangible property, roads, bridges, etc.	Crops matured.	Crops prospective.
Raleigh, N. C.: Roanoke.....		\$3,000				\$27,500
Charleston, S. C.: Pee Dee.....						3,000
Montgomery, Ala.: Coosa.....	\$200	10,700	\$2,000		\$2,500	16,750
Mobile, Ala.: Black Warrior.....					1,500	2,000
Meridian, Miss.: Leaf.....	136,300	13,500	5,050	\$24,950	19,650	45,000

MEAN LAKE LEVELS DURING DECEMBER, 1920.

By UNITED STATES LAKE SURVEY.

[Dated: Detroit, Mich., Jan. 5, 1921.]

The following data are reported in the "Notice to Mariners" of the above date:

Data.	Lakes.*			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during December, 1920: Above mean sea level at New York.....	Feet. 602.25	Feet. 580.12	Feet. 571.89	Feet. 245.40
Above or below—				
Mean stage of November, 1920.....	—0.23	—0.18	—0.06	+0.17
Mean stage of December, 1919.....	—0.08	—0.04	+0.02	—0.34
Average stage for December, last 10 years.....	—0.05	—0.01	+0.15	—0.06
Highest recorded December stage.....	—0.88	—2.46	—1.64	—2.21
Lowest recorded December stage.....	+1.05	+1.12	+1.03	+1.97
Average relation of the December level to—				
November level.....		—0.20	—0.10	—0.20
January level.....		+0.20	+0.10	+0.00

* Lake St. Clair's level in December, 574.77 feet.